A SYSTEMATIC REVIEW OF THE EVIDENCE-BASE FOR PROFESSIONAL LEARNING IN EARLY YEARS EDUCATION (THE PLEYE REVIEW)

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Abstract

In response to the current policy drive to improve the skills level of the Early Years (EY) workforce, raise the quality of EY provision, and reduce the educational disadvantage gap for young children, this systematic review considered professional development and learning (PDL) approaches in Early Years Education (EYE. In particular the research team examined PDL practices that report positive impact on children's outcomes. Twenty-six studies met the criteria for inclusion. Our findings suggest that approaches that combine coaching, the introduction of research evidence and opportunities to reflect on practice can impact positively on children's outcomes in EYE settings. At the same time, the degree of effectiveness of interventions was difficult to evaluate with certainty due to variation in study quality and methodology. Evidence on the significance of duration, frequency and intensity on outcomes for children, though likely to be an important factor in the degree of effectiveness is inconclusive and requires further research.

BACKGROUND

A growing interest in the benefits of evidence-informed teaching practice in schools and the professional learning approaches that might support it can be seen in a number of high profile reviews of evidence on professional learning (see for example BERA/RSA, 2014;; Coldwell et al., 2017; Cordingley et al, 2015). What is clear from examining these reviews, however, is that they focus primarily on schools and 5-18 education. As a result, they often fail to take into consideration the complex professional learning needs of the early years sector and how these might be met in order to improve pedagogy and so, outcomes for young children. At the same time, the early years phase (here the period from birth to six), is at the forefront of educational policy, and is widely viewed as *the* optimum time in which to establish the key dispositions and skills for achievement and success in school (Allen, 2011; Chambers et al, 2016). Agreement across all political parties in the UK for continued expansion of provision to meet the increasing demand for childcare places from working parents, policy intervention in the education of disadvantaged two-year-olds, and an increasing focus on an early years curriculum and pedagogy that supports 'school readiness' in England (DfE, 2012a), indicate

unprecedented interest in early years education. They also presuppose a workforce that is knowledgeable about child development, early learning and the types of interactions with children that support the development of language, early literacy, and executive functioning skills. As such, significant demands have been placed upon the sector to increase the number of suitably skilled and qualified staff in order to raise attainment through high quality early education. One policy response to this challenge in England has been to increase numbers of graduates and qualified teachers in early years settings (DfE, 2012b). Clearly, improving the qualifications and leadership capacity in the sector is one important way to tackle the skills challenge. But it takes time to build a workforce in this way and, moreover, there are many reasons that may prevent early years educators from accessing further study. In a largely female workforce these may include caring and family commitments, lack of access to funds, lack of proximity to colleges and universities, and low self-confidence following extended periods away from education. Or educators may choose to work in a supporting role with individual children and small groups. A key question therefore is: how can we ensure that *all* those who work with young children have fair access to the most effective professional learning opportunities?

Evidence on the types of professional learning and development (PDL) that can improve outcomes for children is relatively scarce. Moreover, studying the effectiveness of PDL programmes is challenging not least because it is difficult to isolate the multiple variables that comprise a PDL programme to demonstrate causal links between improvements in EYE practice and outcomes for children. Understanding the link between PDL and improved outcomes for children is, however, increasingly important in a UK policy context that supports rapid expansion of EY provision to meet current and future demand for childcare places for working parents and an explicit focus on educational provision that supports 'school readiness', particularly in England (DfE, 2014). Such developments presuppose the availability of a workforce that is knowledgeable about child development, curriculum, early learning and the types of interactions with children that support the development of language, early literacy, and executive functioning skills (Sylva, 2014). One policy response to the shortage of suitably skilled and knowledgeable staff in England, is to increase numbers of graduates and qualified teachers in early years settings (DfE, 2012; 2017), a move informed by the reported links between higher qualifications, high quality provision and improved outcomes for the most disadvantaged children (Mathers and Smees; 2014).

Improving the qualifications profile of the sector, and increasing pedagogical leadership capacity is one important way to tackle the skills gap. But it takes time to build a workforce in this way and does not address the immediate need. Additionally, access to further study is challenging to a largely female workforce who may have caring and family commitments

(Osgood, 2012), lack of funding (Kalitowski, 2012; DfE 2017), lack of proximity to colleges and universities, and low self-confidence following extended periods away from education (Barkham, 2008). In addition, some educators prefer to remain in a supporting role, valuing the opportunity this affords to work with individual children and small groups (Barkham, 2008). Further, the recent government Workforce Strategy (DfE, 2017) noted that some employers find it difficult to attract and/or retain specialist graduates and 'would like more opportunities to develop the staff already in their workforce to become pedagogical specialists' (2017, p.9). With this in mind, the present systematic review attempts to draw together PDL interventions that report favourable outcomes for children, identify implications for practice and identify gaps in the literature for future investigation.

REVIEW QUESTIONS

The aim of the review was to identify approaches to PDL that demonstrate impact on children's outcomes. To meet this aim we sought to answer the following three research questions:

1. What evidence is there of impact of professional learning approaches for improving outcomes for children in EYE? Which approaches are more and less impactful?
2. What are the features of and the theory of action underpinning effective professional learning approaches in EYE?
3. What types of professional learning opportunities are available to EY practitioners and who provides them? How do these relate to 1) and 2), above?

METHODS OF THE REVIEW

Utilising the guidelines and software developed by the EPPI Centre, we undertook a systematic review of evidence on the most effective forms of PDL in EYE. The key features of a systematic review or systematic research synthesis, such as the approach developed by the EPPI-centre are that:

- They are explicit and transparent methods are used;
- They form a piece of research in its own right that follows a stage process of retrieving, screening and reviewing literature items;
- They can be both, replicable and updateable;
- There is a requirement for user involvement to ensure reports are relevant and useful (with user engagement occurring before, during and after the review process). In our case this comprised a Review Advisory Group of key stakeholders (listed in the acknowledgements section)

In general terms, systematic reviews aim to find as much as possible of the research relevant to the particular research questions, and use explicit methods to identify what can reliably be said on the basis of these studies. Methods should not only be explicit but systematic with the aim of producing valid and reliable results: establish selection criteria; conduct searches; assess study quality and bias; extract data and conduct data analysis and synthesis; write the report and disseminate findings.

Search strategy

Our search strategy comprised four main approaches:

a) a search of electronic-databases*:* Academic Search Elite/EBSCOhost; Campbell; Child Care and Early Education Research Connections (CCERC); Dragon (The University of Hong Kong Libraries Catalogue); Danish Education Clearinghouse; Educational Resources Information Center (ERIC); Google Scholar; JSTOR; National Child Care Information Center (NCCIC); Psychology and Behavioral Sciences Collection; PsycInfo; Social Sciences Abstracts; Sociological Collection; Web of Science; What Works Clearing House (WWC) USA

b) hand searches of journals: International Journal of Early Years Education; Early Years; Contemporary Issues in Early Childhood Education; Journal of Early Childhood Teacher Education; Journal of Educational Psychology; Professional Development; Child Development

c) specialist website searches: OECD (The Organisation for Economic Cooperation and Development); BERA/TACTYC (British Educational Research Association); NAEYC (National Association of Education for Young Children, USA); NIEER (National Institute for Early Education Research, USA); EPPI-centre reviews.

d) personal contacts/authors and experts in the field: the authors of this report are all active members of national and international research networks in their respective fields.

We undertook an exhaustive search of studies of provision for children aged birth to six, with a publication date from 2000, reflecting a particularly significant period in the development of early years education. We deployed search terms around two key areas framing our study: *Early years* (e.g. Early years/early childhood, early childhood education, ECEC, kindergarten, childcare, day care, preschool, reception class, nursery, Head Start, language development, literacy development, early intervention, low-income families, teacher-child

interactions, child-care assistants, nursery nurses) and *Professional learning/professional development* (e.g. professional learning, teacher development, teacher preparation, continuing professional development, CPD, action research, teacher change, professionalism, competence, joint practice enquiry, lesson study, reflective practice).

Selection of studies for in-depth review

The initial search provided 1,197 articles/documents/reports for screening. The selection of the studies for final inclusion and in-depth review involved a four-step process:

Stage 1. Single Screening by Title and Abstract (T & A)

In the first stage, the 1197 articles were divided in 3 groups. Each member of the research team screened 399 articles according to the following 5 criteria:

1. Study has a publication date including and after 2000
2. Focused on EYE/ECE settings, children in 0-6 age range
3. Subjects of the intervention must be in-service EYE workers
4. The methods and/or analytical approaches are described in detail
5. The topic of the study is related to the implementation of professional learning/development

Stage 1 process led to the inclusion of 124 studies for full text screening.

Stage 2. Triple Full Text Screening

In Stage 2 the three members of the team did a full text screening of the 124 articles selected in the first stage to assess quality of method and topic relevance. Of the 124 studies included here, 70 were excluded on the basis that they did not meet the quality and topic criteria sufficiently.

This stage led to 54 studies included for in-depth review in Stage 3

Stage 3. In-depth review

To address the aims of the review and in addition to the 5 criteria described above, a further criterion was applied for the Stage 3 screening:

6. The study must clearly report on children's outcomes in a rigorous and robust way.

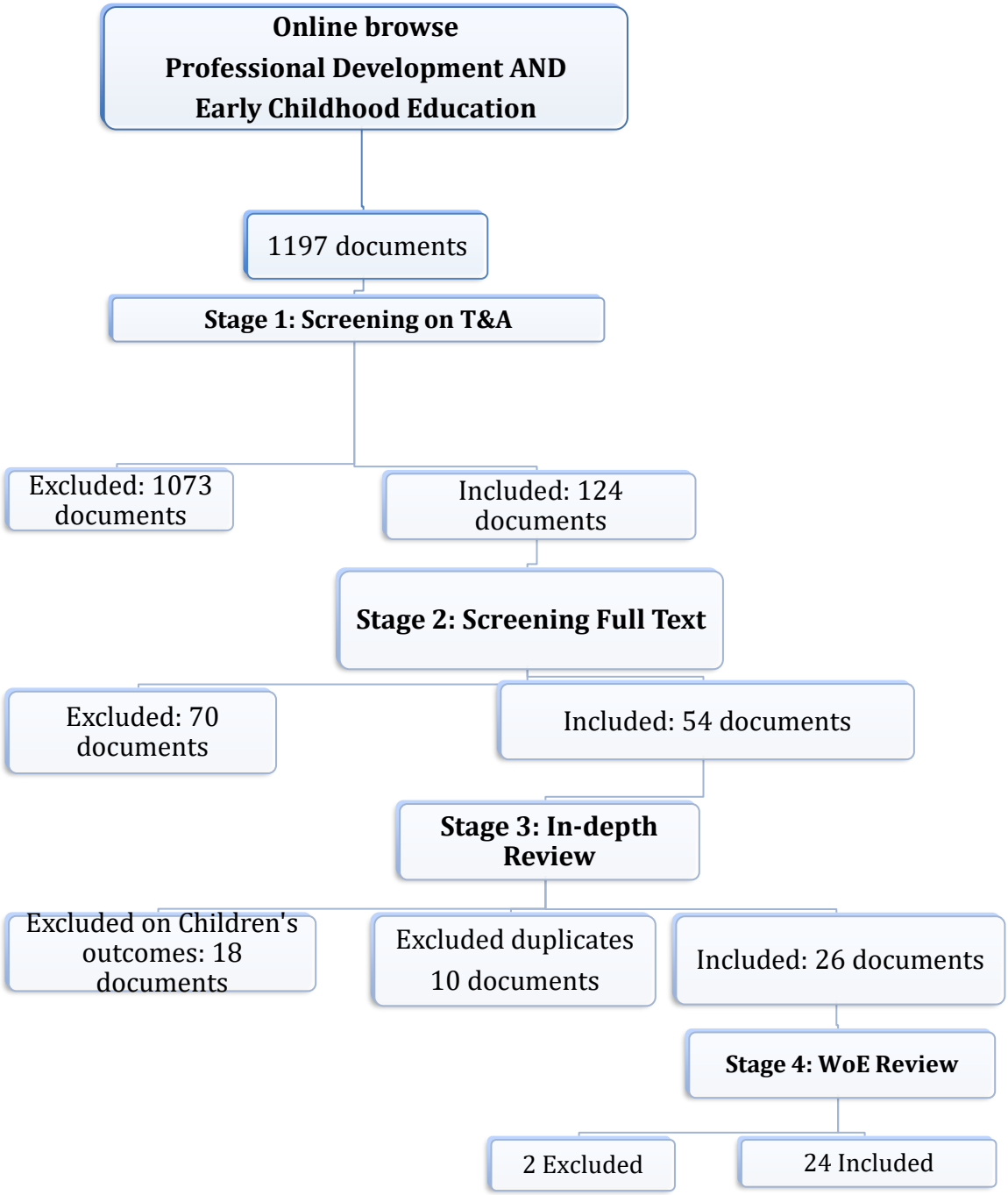
The 54 studies remaining in this stage were subjected to in-depth review by pairs of researchers. 18 studies were then excluded. Finally, we excluded 10 duplications. The final set of studies that met the criteria in full totalled 24. 23 are peer-reviewed articles, 1 is a

chapter of a book. 22 of the outputs are from United States; 1 from Canada; and 1 from New Zealand. We did not find any studies that looked specifically at the impact of PDL on outcomes for children in the UK context.

Stage 4. Weight of Evidence Framework

Finally, a review of the quality of the 24 studies was made through the Weight of Evidence (WoE) framework proposed by Gough (2007).

Figure 1: PLEYE Systematic Review Process.


Online browse
Professional Development AND
Early Childhood Education
1197 documents
Stage 1: Screening on T&A
Excluded: 1073 documents
Included: 124 documents
Stage 2: Screening Full Text
Excluded: 70 documents
Included: 54 documents
Stage 3: In-depth Review
Excluded on Children's outcomes: 18 documents
Excluded duplicates 10 documents
Included: 26 documents
Stage 4: WoE Review
2 Excluded
24 Included

Criteria for assessing quality: Weight of Evidence Framework

Quality appraisal of individual studies included in this review followed the EPPI Centre guidelines. These guidelines considered whether the studies reported a method for allocation, control of attrition and selective reporting bias. Additionally, studies were assessed regarding sample justification, i.e. whether the authors justified the sample size *n* and evaluated their power estimate; quantitative impact of the intervention; description of PDL process; report on the methods to establish reliability and validity and finally whether authors included measure of fidelity of treatment (Cordingley et al., 2007; Basma & Savage, 2017; Gough, 2007; Oakley, 2003). The quality assessment for this study was undertaken by a graduate research assistant and reviewed by the primary author. As a result of this process, two further studies were excluded (Low quality score), leaving a final total of 24 articles to be considered for the synthesis.

SYNTHESIS

The review synthesis represents an integration of our findings and leads to a synthesis of studies with a result that is 'greater than the sum of the individual studies' (Gough et al., 2012, p.283). The initial search resulting in 1197 papers at Stage 1 comprised a diverse mix of theoretical or conceptual studies and those that provided findings (which could be either qualitative or quantitative in nature). However, the final 24 studies, which met our criteria were all interventions that used experimental or randomised control trial methodologies. In synthesising these findings, we attempted to do three things:

1) Build a theory of action that outlines why and how professional development is effective, and for whom;

2) Understand the ways in which the empirical findings relate to this conceptual frame and the extent to which they augment or challenge it. Does it show observed effects or even, does it provide conflicting evidence on proposed drivers for action;

3) Understand where further empirical evidence is required because it is either absent or lacking in type (qualitative or quantitative), amount, or robustness.

A conceptual model for assessing impact

To meet the first of these aims, the project team employed the Dialogic Model of Impact (DMI) developed by Brown and Graydon (2017) as the basis of a theory of action (ToA) to examine why and how professional development is effective, and for whom. Theories of action are described by Earl and Timperley (2015: 19) as the reasoning organisations use to

describe how they will make change in the world; with the 'theory' aspect of a ToA providing an explanation of why certain things happen. Theories of action are thus perhaps best thought of as the journey guide for impact, that steers educators towards their intended long term outcomes, or the difference an innovation is designed to make for a given group or set of stakeholders. To help educators reach this long-term vision ToAs provide the steps that need to occur along the way.

DMI developed from an examination of existing impact measurement models. As part of this examination it became clear that common amongst these models is the idea that impact occurs through a process of change that stretches across a number of different 'levels'. Correspondingly, these levels can be used to assess the extent of positive change achieved by a given innovation or intervention for a particular group. More specifically, DMI comprises the following eight domains of impact as set out below

1. The context in which the school or setting is situated
2. The problem or driver for innovation
3. Detail on the innovation and how it was intended to result in change
4. Activities and interactions related to the introduction and roll-out of the approach
5. Learning that results from engaging in these activities/results from interactions
6. Changes in behaviour (and the extent to which something is being used):
7. What difference have behavioural changes made?
8. Reframing value: reassessing what is possible in relation to the innovation

As a consequence, by looking at impact and how this impact was achieved we have been able to examine commonalities in the professional learning interventions according to the type of impact and the approaches undertaken to secure improved outcomes in early years settings. In applying this conceptual frame to our synthesis and analysis we aim to better understand the relationship between:

- the aims of a professional learning intervention,
- what did it intend to achieve, how and why?
- how it was put into practice and
- what if any impact it achieved and how do we know?

In the next section we move towards our findings, first by characterising the literature, which in itself can give indications of how professional learning is viewed by early years policy

makers and ‘budget holders’ and in so doing highlight challenges in delivering professional learning that is effective in achieving its intentions for impact.

FINDINGS

Applying our conceptual model outlined above, as well as assessing the extent of positive change achieved by a given intervention (and whether this occurs in terms of knowledge, practice and/or children’s outcomes), the domains identified in the DMI can also be employed to think about why an intervention should cause such change. We used domains 3 to 7 of the DMI model to deconstruct the interventions specified in our 24 papers, interrogating each study with the following questions:

- What type of professional learning intervention was used? (Domain 4)
- What were the aims of the professional learning intervention? For example, quality of setting, content knowledge; (Domain 3)
- How were the interventions delivered? (Domain 4)
- What changed as a result – teacher’s knowledge and practice? (Domains 5 and 6)
- What changed as a result – children’s outcomes? (Domain 7)
- What types of Professional Learning interventions were used?

What type of professional learning intervention was used?

Table 1 below provides detail on the type of PDL intervention. Of these, 15 of the 24 interventions considered involved some form of coaching or mentoring though the differences between them was not always clearly explained (e.g. Podhajski and Nathan, 2005), though all made reference to generic strategies such as modelling, feedback, support and guidance. Powell et al. (2010) compared on-site and remote online coaching but found no differential effects between these. Where evidence of impact on children’s outcomes was reported, coaching and mentoring were used in combination with other aspects (e.g. instructional tools for teachers, Chen and McCray, 2012), with varying degrees of content input and duration. One study offered only a two-hour workshop on literacy but found no evidence of impact on teaching practice or child outcomes, measured eight weeks later (McLachlan and Arrow; 2014), raising questions about the role played by intensity and duration in the effectiveness of PDL programmes. The second most common feature (evident in six interventions) was the use of classroom activities (e.g. lesson plans and ideas for developmentally appropriate activities), or the provision of other instructional approaches. Group work and tasks to help educators understand concepts featured in five studies. Four of the interventions involved approaches to develop teacher content knowledge, while two provided scholarships to attend community college courses. The preponderance of coaching

in our final set of studies offered approaches with greater flexibility for building on practitioners' existing knowledge and skills along the lines of a social constructivist apprenticeship model widely viewed as an effective and responsive learning approach.

Table 1. Type of PDL Interventions

Studies	Coaching and mentoring	Learning labs	Classroom implementation	Tasks and group work	Scholarships	On-line PDL
Brendefur et al. (2013)			X			
Cain et al. (2007)	X					
Campbell and Milbourne (2005)				X		
Chen and McCray (2012)	X	X	X			
Collins and Dennis (2009)	X		X		X	
Conroy et al. (2013)	X					
Downer et al. (2011)						X
Gallagher et al. (2011)	X					
Gettinger and Stoiber (2008)	X		X			
Hindman and Wasik (2012)	X		X			
Jackson et al. (2006)	X	X				
Kermani and Aldemir (2015)						
Landry et al. (2009)	X					X
Landry et al. (2011)	X					X
Lane et al. (2014)	X					
Lonigan et al. (2011)	X					

Studies	Coaching and mentoring	Learning labs	Classroom implementation	Tasks and group work	Scholarships	On-line PDL
Marcon et al. (2012)					X	
Martin et al. (2007)					X	
McLachlan and Arrow (2014)		X				
Milburn et al. (2015)	X					
Piasta et al. (2015)						
Podhajski and Nathan (2005)	X	X				
Porche et al. (2012)			X			
Powell et al. (2010)	X			X		X
Sarama et al. (2008)	X		X			
Swaminathan et al. (2014)		X				

What were the aims of PDL interventions used?

Table 2 below shows the aims underpinning the different interventions. Nineteen interventions focused on developing teachers' pedagogical (or instructional), knowledge whilst 15 focused on enhancing teachers' content knowledge. Ten interventions focused on both. Pedagogical knowledge is the specialised knowledge of teachers for creating effective teaching and learning environments for all children, and knowledge of the techniques and strategies used for supporting children's learning of a new skill, concept or information, such as 'scaffolding' or open-ended questions. Content knowledge is knowledge of a particular subject such as mathematics or language development. However, most interventions reported multiple aims to ensure the improvement of children's outcomes. One study included also a focus on teacher's attitudes and beliefs about content knowledge (Chen and McCray, 2012). Three studies included objectives regarding the maintenance and

sustainability of the PDL learning within the organisation, focusing on organisational support, leadership, and participants' responsibilities and accountability; on beginning to create (and eventually institutionalise) a support infrastructure; on developing the necessary support to scale up interventions and build expectation and camaraderie to support changes in practice (e.g. Porche, Pallante and Snow, 2012; Sarama et al., 2008). Finally, two studies focused on developing explicit strategies for classroom management, for instance helping teachers to reduce children's challenging behaviours (e.g. Conroy et al., 2014; Lonigan et al., 2011).

Table 2. Aims of PDL Interventions

Studies	Enhance teachers' content knowledge	Improve teachers' attitudes	Develop instructional	Improve quality of settings	Classroom management	Promote children's learning outcomes	Develop organisational
Brendefur et al. (2013)	X		X			X	
Cain, Rudd and Saxon (2007)	X						
Campbell and Milbourne (2005)				X			
Chen and McCray (2012)	X	X	X				
Collins and Dennis (2009)	X		X			X	
Conroy et al. (2013)			X		X		
Downer et al. (2011)			X			X	
Gallagher et al. (2011)			X			X	X
Gettinger and Stoiber (2008)			X			X	

Studies	Enhance teachers' content knowledge	Improve teachers' attitudes	Develop instructional	Improve quality of settings	Classroom management	Promote children's learning outcomes	Develop organisational
Hindman and Wasik (2012)	X			X		X	
Jackson et al. (2006)			X			X	
Kermani and Aldemir (2015)	X					X	
Landry et al. (2009)			X			X	
Landry et al. (2011)			X			X	
Lane et al. (2014)	X		X			X	
Lonigan et al. (2011)	X		X		X		
Marcon et al. (2012)	X		X				
Martin et al. (2007)			X				
McLachlan and Arrow (2014)	X						
Milburn et al. (2015)			X				
Piasta et al. (2015)			X			X	
Podhajski and Nathan (2005)	X		X				
Porche, Pallante and Snow (2012)	X		X				X
Powell et al. (2010)	X		X	X		X	

Studies	Enhance teachers' content knowledge	Improve teachers' attitudes	Develop instructional	Improve quality of settings	Classroom management	Promote children's learning outcomes	Develop organisational
Sarama et al. (2008)	X		X				X
Swaminathan et al. (2014)	X						

How were the PDL interventions delivered?

Table 3 below summarises the different types of the PDL interventions identified in the included studies. As described in Table 1 above, coaching and to a lesser extent mentoring featured most prominently in our final set of included studies. However, little information was given in the papers to distinguish between them. Each of these approaches imply close and specialised support for practitioners to model best practices and the provision of feedback from either more experienced peers or experts. Along with these elements, 12 studies included a workshop; these were held at the beginning of the intervention or at intervals across the duration of the PDL interventions (e.g. Campbell and Milbourne, 2005; Lonigan et al., 2011; Milburn et al., 2015, Powell et al. 2010). 14 studies used research-based interventions about children's development and learning, or content and pedagogical knowledge (e.g. Cain, Rudd, and Saxon, 2007; Jackson et al., 2006; Kermani and Aldemir, 2015; Podhajski and Nathan, 2005 and Powell et al. 2010). The teaching methods were varied across the interventions, ranging from attending college-courses and interactive lectures to more participatory strategies including hands-on activities such as constructing material or role-plays (e.g. Lonigan et al., 2011; Collins and Dennis, 2009; Sarama et al., 2008; Cain, Rudd, and Saxon, 2007; and Powell et al., 2010). Videotaping teachers' practices were used in some interventions to illustrate key strategies (e.g. Downer et al., 2011; Sarama, et al., 2008). Five studies used technology to support practitioners. For instance Lane et al. (2014) tested a distance-mentoring model in which participants received the lessons by email. Likewise, Porche, Pallante and Snow (2012) supplemented the on-site coaching with teacher-initiated phone and e-mail check-ins. Landry et al. (2009) evaluated an online professional development course and Downer et al. (2011) used a web-based PDL. Five of the included studies offered a collaborative element promoting group work

among practitioners during workshops and providing group staff development (Sarama et al., 2008).

At an institutional level, three interventions considered the need to promote organisational support to intensify teachers learning and engagement and ensure the sustainability of the PDL programme (e.g. Porche et al. 2012; Sarama et al., 2008). Sarama et al. (2008), Collins and Dennis (2009); Gettinger and Stoiber (2008) provided supportive roles and materials for parents.

Another relevant element to consider regarding the operationalisation of PDL interventions was the frequency and intensity of programmes. This implies on-going on-site support for practitioners throughout the duration of the intervention. Collaboration among key participants and peers features as an important consideration when implementing effective PDL.

Table 3. How was the PDL delivered?

Studies	Coaching	Mentoring	Workshop	Research based intervention	Collaboration	Organisational support	Frequency and intensity of PDL	Use of technology	Work with the family	Video tape lessons	College lectures
Brendefur et al. (2013)			X	X							
Cain, Rudd and Saxon (2007)	X			X							
Campbell and Milbourne (2005)			X				X				X
Chen and McCray (2012)	X						X				
Collins and Dennis (2009)	X	X	X	X			X		X		X
Conroy et al. (2013)	X										

Studies	Coaching	Mentoring	Workshop	Research based intervention	Collaboration	Organisational support	Frequency and intensity of PDL	Use of technology	Work with the family	Video tape lessons	College lectures
Downer et al. (2011)	X			X			X	X		X	
Gallagher et al. (2011)		X	X	X	X						
Gettinger and Stoiber (2008)	X			X	X		X		X		
Hindman and Wasik (2012)	X						X				
Jackson et al. (2006)		X		X							X
Kermani and Aldemir (2015)				X			X				
Landry et al. (2009)		X	X	X			X	X			
Landry et al. (2011)		X	X	X				X			
Lane et al. (2014)		X						X			

Studies	Coaching	Mentoring	Workshop	Research based intervention	Collaboration	Organisational support	Frequency and intensity of PDL	Use of technology	Work with the family	Video tape lessons	College lectures
Lonigan et al. (2011)		X	X								
Marcon et al. (2012)											X
Martin et al. (2007)											X
McLachlan and Arrow (2014)			X								
Milburn et al. (2015)	X		X								
Piasta et al. (2015)			X							X	
Podhajski and Nathan (2005)		X		X							
Porche, Pallante and Snow (2012)	X			X		X		X			
Powell et al. (2010)	X		X	X			X	X			

Studies	Coaching	Mentoring	Workshop	Research based intervention	Collaboration	Organisational support	Frequency and intensity of PDL	Use of technology	Work with the family	Video tape lessons	College lectures
Sarama et al. (2008)	X			X	X	X			X	X	
Swaminathan et al. (2014)			X								

What changed as a result? – Teachers' knowledge and practice.

The studies we reviewed showed five key areas of change: 1) changes in teachers' content knowledge; 2) changes to teachers' procedural knowledge; 3) improvements to the organisation of the classroom environment; 4) changes in teacher-child interactions; and 5) changes in joint attention with children under 3. Nine studies reported changes to teachers' content knowledge, reporting impact on teachers' vocabulary (as well as that of their children); increased awareness of the way in which they engaged with children; and knowledge of their practices and environment. For example, Jackson et al. (2006) and Collins and Dennis (2009) both combined mentoring and research approaches, and in the case of Collins and Dennis (2009), workshops and college lectures, to achieve change, suggesting that models of PDL that give both new knowledge and 'scaffolded' support are effective at instigating change in practice. In addition, both studies met high levels of frequency and duration in delivery. By comparison McLachlan and Arrow (2014) reported no changes in teacher understanding of phonological awareness and little impact on children's outcomes following an 8-week programme consisting of a 2-hour workshop prior to implementation. They conclude that 'teachers need greater involvement or time for changes in beliefs and practices to occur' (2014, p.835), highlighting also the importance of subject knowledge with ongoing PDL such as coaching and feedback to ensure impact on children's learning. Nine studies showed changes in procedural knowledge with impact on improved lesson planning; improvement of ECE settings ability to deliver high-quality, pre-literacy skills development instruction and enhanced practice such as: being more conscious of emphasising sounds in words; pointing out the alphabet to children; emphasising names and writing of names on artwork; encouraging writing of stories; and so on. The majority of the final 24 studies focused on children of preschool age (3-6). Only one study (Cain et al., 2007) focused on children from 18-24 months. In that study the change in teacher knowledge was in developing joint attention in developmentally appropriate ways. This finding highlights the lack of research on the impact of professional learning on those who work with the youngest children in EYE.

Table 4. Changes in teachers' knowledge and practices

Studies	Teachers' content knowledge	Teachers' procedural knowledge	Organisation of classroom environment	Joint attention	Teacher-child interaction
Brendefur et al. (2013)					
Cain, Rudd and Saxon (2007)				X	
Campbell and Milbourne (2005)			X		
Chen and McCray (2012)					
Collins and Dennis (2009)	X	X			
Conroy et al. (2013)					X
Downer et al. (2011)		X			X
Gallagher et al. (2011)		X			
Gettinger and Stoiber (2008)					
Hindman and Wasik (2012)	X		X		
Jackson et al. (2006)	X	X	X		
Kermani and	X				

Studies	Teachers' content knowledge	Teachers' procedural knowledge	Organisation of classroom environment	Joint attention	Teacher-child interaction
Aldemir (2015)					
Landry et al. (2009)	X	X			
Landry et al. (2011)	X	X			
Lane et al. (2014)		X			
Lonigan et al. (2011)					X
Marcon et al. (2012)	X				
Martin et al. (2007)					
McLachlan and Arrow (2014)		X			
Milburn et al. (2015)	X				
Piasta et al. (2015)					
Podhajski and Nathan (2005)					
Porche, Pallante and Snow (2012)					
Powell et al. (2010)	X	X			
Sarama et al. (2008)					

Studies	Teachers' content knowledge	Teachers' procedural knowledge	Organisation of classroom environment	Joint attention	Teacher-child interaction
Swaminathan et al. (2014)					

What changed as a result? – children's outcomes.

The studies included in this review reported on four types of children's outcomes:

1. Joint attention engagement (1);
2. Literacy knowledge and skills (16)
3. Mathematical and science knowledge and skills (5) and
4. Socio-emotional/behavioural development (2).

Three of the included studies did not report positive gains in children's outcomes (Cain, Rudd and Saxon, 2007; Piasta et al., 2015; Porche, Pallante, and Snow, 2012). Lonigan et al. (2011) reported positive gains as a result of curriculum change but reported that the impact of professional development was insignificant. Furthermore, in the study by Jackson et al. (2006) gains in child outcomes were mixed so that there were positive gains in children's print recognition and letter knowledge, but there were no measurable changes in phonological awareness or oral language, nor any measurable effect on children's socio-emotional development. In studies which reported positive outcomes, coaching, mentoring and feedback often in combination with other approaches, such as introduction of new knowledge and research evidence appeared to be most effective in impacting positively on child outcomes.

Table 5. Children's outcomes

Studies	Joint attention engagement	Literacy skills and knowledge	Mathematical abilities	Socio-emotional development
Brendefur et al. (2013)			X	

Studies	Joint attention engagement	Literacy skills and knowledge	Mathematical abilities	Socio-emotional development
Cain, Rudd and Saxon (2007)	X			
Campbell and Milbourne (2005)				
Chen and McCray (2012)			X	
Collins and Dennis (2009)		X		
Conroy et al. (2013)				
Downer et al. (2011)		X		X
Gallagher et al. (2011)		X		
Gettinger and Stoiber (2008)		X		
Hindman and Wasik (2012)		X		
Jackson et al. (2006)		X		
Kermani and Aldemir (2015)			X	
Landry et al. (2009)		X		
Landry et al. (2011)		X		
Lane et al. (2014)		X		
Lonigan et al. (2011)				
Marcon et al. (2012)		X		

Studies	Joint attention engagement	Literacy skills and knowledge	Mathematical abilities	Socio-emotional development
Martin et al. (2007)		X		
McLachlan and Arrow (2014)		X		
Milburn et al. (2015)		X		
Piasta et al. (2015)			X	
Podhajski and Nathan (2005)		X		
Porche, Pallante and Snow (2012)				
Powell et al. (2010)		X		
Sarama et al. (2008)			X	
Swaminathan et al. (2014)				X

Characteristics of the included studies

Table 6 below facilitates cross-referencing between the characteristics of study design, the type of intervention, focus of PDL, duration and composition of participants. We found no studies conducted in the UK, which reported impact of PDL on child outcomes (24 USA, 1 Canada, 1 New Zealand). Each of the included studies reported on interventions that were funded by state or federal government. Most interventions (17) focused on literacy and language and to a lesser extent on other basic subjects such as mathematics and science. Most studies (21) gave detailed information on the participants, the majority of which were diverse groups of practitioners, with mixed qualifications and experience reflecting the type of EYE workforce also found here in the UK. The prevalence of coaching seen in the included interventions (most of which reported gains in child outcomes), highlights again the potential of this responsive approach for a diverse and sometimes hard-to-reach workforce i.e. home-based providers and low qualified practitioners. Absent from this set of

interventions, however, is any kind of economic evaluation, so it is difficult to judge the cost effectiveness of this approach, particularly in relation to duration, frequency and intensity. A further factor discussed in many of the papers is the critical part played by the fidelity of implementation of PDL by participants, to achieving impact. Coaching and regular opportunities for intervention participants to keep in touch and catch up may support higher levels of fidelity and ensure best possible confidence in study findings. Some studies provided information on the level of attrition in study samples. High turnover of staff in EY settings in some cases impacted on the interventions, as did withdrawal from the study. However, regular coaching support can help high rates of attrition in the workforce and hence ensure greater stability in settings.

Table 6 .Characteristic of studies included

Study (by author)	Study design	Elements of PDL	Topic of PDL	Duration PDL	Content group	Composition Workforce
Brendefur et al. (2013)	RCT	Workshop + classroom activities	Early maths.	6 months	24 teachers. 16T & 111C (intervention) 8T & 33C (control)	36% High-School 17% Associate 31% BA 14% master
Cain, Rudd and Saxon (2007)	RCT	Workshop + coaching	Joint attention engagement (Language)		48 childcare providers	16 High-School, 28 College 3 Associate 1 BA
Campbell and Milbourne	RCT	Workshop + consultation	Quality ECE	3 months training	180 caregivers, 114 ECE rooms,	1% No High-School diploma 78% High-School 3% some

(2005)						college, 10% Associate 7% BA 1% Post-bachelors' work
Chen & McCray (2012)	Quasi experimental with intervention and control group	Workshop, coaching and classroom implementation	Early maths.	2 years	No info	No Info
Collins & Dennis (2009)	Intervention	Workshop, mentoring and home support	Language, literacy	3 years	8 Head Start classrooms	8 BA 6 masters' degree. 4 assistants 60 hr college credit
Conroy et al. (2013)	Descriptive non experimental	Workshop + coaching	Children's behaviour	14 weeks	10 teachers and 19 children	10 BA degree and current teacher certification.
Downer et al.	RCT	Workshop and	Language,	2 years	161 teachers, 1,338	62.1% BA

(2011)		web-based support	literacy		children	36% advanced degrees
Gallagher et al. (2011)	RCT	Workshop + mentoring	Language	1 school year	16 mentors	62.5% college degrees.
Gettinger & Stoiber (2008)	RTI (Response To Information)	Workshop + coaching	Early literacy	2 years	15 teachers and 15 assistants	15 Associate (ECE)
Hindman & Wasik (2012)	RCT	Workshop + coaching	Language and literacy	2 years	16T intervention and 10T control 626C interv. & 357C control	1 working toward Associate 3 Associate 12 BA 1 Master
Jackson et al. (2006)	Experimental	Workshop + mentoring	Literacy	15 weeks	22 teachers 17 control	No info
Kermani & Aldemir (2015)	Quasi experimental	Workshop and support from research team	Science, math	6 hrs of PDL	4 teachers	4 BA

Landry et al. (2009)	RCT	Online training + mentoring	Language, literacy	2 years	262 teachers	146 High School/CDA 73 Two-year college; 181 4+ years college
Landry et al. (2011)	RCT	Online training + mentoring	Language, literacy	2 years	209 teachers in intervention; (+)1200 teachers control.	Different groups
Lane et al. (2014)	Experimental	Online PDL	Language	24 weeks	27 teachers	18 High-School 41 Associates 36 BA/BS 4 Ma/MEd
Lonigan et al. (2011)	Cluster-randomized	Workshop + mentoring	Language, literacy	1 year	739 children	No Info
Marcon et al. (2012)	RCT	Workshop + technical assistance	Language	7 months	181 teachers intervention and 20 control	No Info
Martin et al. (2007)	Experimental	Coaching + materials + parent's education	Language	2 years	Aprox. 100 children. 11 classrooms	No Info

McLachlan and Arrow (2014)	Quasi experimental	Workshop	Literacy	8 weeks	32 teachers 103 children	3 No Qual 5 BA 3 Diploma in teaching 2 Graduate Diploma in 3 in training
Milburn et al. (2015)	RCT	Workshop and coaching	Literacy	6 months	31 teachers and 121 children	No Info
Piasta et al. (2015)	Quasi experimental	Workshops and video	Maths and Science	18 months	Mixed Early Childhood Centres	31% Non-grad 55% Degree 13% Masters
Podhajski and Nathan (2005)	Experimental	Workshop and mentoring	Literacy	2-day workshop, 6 monthly 45 min mentoring visits	Mixed childcare providers incl home-based	45% non-teaching qual 55% Degree+teaching qual
Porche, Pallante and	Experimental	Workshop + coaching	Literacy (CLLIP)	1 year	124 kindergarten, 148 Grade 4	Kindergarten and Elementary teachers

Snow (2012)						
Powell et al. (2010)	RCT	Literacy coaching	Early literacy	36 hours	749 children (experimental and control groups)	Teachers 2 and 4 year degree plus
Sarama et al. (2008)	RCT	Distance learning, in-class coaching	Maths. (TRIAD)	1 year	25 teachers 209 children	Pre-K Teachers
Swaminathan et al. (2014)	Evaluation; pre-post test	Workshops, reflective shared learning	School readiness, Language & Cogn. Develop.	10 months, 15 hours	No info	Mixed assoc. degree

Having made some general observations about the literature, and provided descriptive detail on the included studies we move on to address our research questions.

What evidence is there of impact of professional learning approaches for improving outcomes for children in EYE? Which approaches are more and less impactful?

The majority of studies considered which reported positive outcomes for children, used a combination of PDL approaches, which at a general level is best described as input and follow up. Input included face-to-face workshops and/or on-line tutoring. Follow up was predominantly coaching, mentoring (with little distinction made between these) and/or tutor feedback. The preponderance of coaching as an approach to PDL is perhaps not surprising. This finding corroborates evidence from the wider literature regarding the efficacy of coaching as a professional development tool. Coaching, defined as a 'process of equipping people with the tools, knowledge, and opportunities they need to develop themselves and become more effective' (Peterson and Hicks, 1996; as cited by Feldman and Lankau, 2005, p. 841), is now widely adopted in a number of countries (including England, USA, Canada and Australia) as a way of achieving and enhancing professional learning and building capacity for more effective goal attainment, change management and improved educational outcomes (van Nieuwerburgh, 2012). Coaching has been shown to be effective in helping educators enhance their skills and develop new habits, as well as apply theoretical learning to workplace practice (Creasy and Paterson, 2005; van Nieuwerburgh, 2012), and is considered to be effective because it supports professional development, practice sustainability and continuous improvement (Creasy and Paterson, 2005, p. 5). Moreover, evidence from randomised controlled trials suggest that compared to other forms of practice support, such as one-off workshops, the active steps involved in coaching, such as goal-setting, action planning and ongoing assessment and support (e.g. Goff et al., 2014), appear to be more likely to help educators overcome challenges, stay motivated and stay on track as they pursue specific goals.

It is not, however, only the type of PDL that is important in contributing to positive impact on children's learning. How long (duration), how often (frequency) and how much support (intensity) appear also to be significant. From the studies we considered, it is not possible to say precisely how much or little is optimally effective as not all studies gave sufficient detail on this and there was much variation between studies in terms of these parameters (see table 6). Consulting the wider literature, there seems little agreement on this aspect. For example, in a study of coaching duration and its impact on outcomes, Shidler (2009) reported that more time is not always better. Rather it is the type and quality of interaction between coaches and practitioners that becomes a deciding factor in efficacy of coaching. A

systematic review of PDL and student literacy outcomes conducted by Basma and Savage (2017) reported that less rather than more than 30 hours of PDL appeared to be effective at raising literacy standards however they also note that longer PDL may take longer to impact on practices and outcomes. Similarly, in a systematic review of effective curricular approaches in EYE, Chambers et al (2010) note that brief studies may not allow programmes to show their full effects.

However, one study included in the present review provided some convincing evidence on duration. The Exceptional Coaching for Language and Literacy (ExCELL) intervention (reported in Hindman, and Wasik; 2012), implemented in Head Start preschool settings for disadvantaged children examined whether 2 years of the ExCELL coaching programme is linked to greater gains for teachers and children, than 1 year of coaching. The authors report that whilst 1 year of ExCELL coaching is linked to gains in the quality of teachers' classroom environments and instructional interactions, which in turn promote gains in children's vocabulary, alphabet, and phonemic awareness skills, a second year of coaching is uniquely predictive of additional growth in teachers' instructional interaction quality and in children's vocabulary gains (2012; p.151). A second factor stemming from this study, especially pertinent to this review is the relationship between coaching and content or new knowledge. The authors note that coaching focused on the quality of the environment (e.g. availability and use of books, writing materials, and print) may be easily understood and quickly translated into new practices by teachers. On the other hand, changing instructional interactions around these tools (e.g. using rich vocabulary, asking open-ended questions, and providing precise feedback) may 'challenge teachers to alter culturally embedded and sometimes automatic patterns of communication and conversation, thus requiring more time for training and reflection' (2012: p.134). This reflects findings from McLachlan and Arrow (2014) who reported that change in beliefs and practices takes longer, but additionally highlights the need for reflection and feedback during that time. For the purposes of the present review, it is valuable to understand who might benefit most from a longer period of coaching and why. Hindman and Wasik (2012) offer three possibilities:

- teachers who initially demonstrate lower-quality classroom literacy environments or instructional interactions might benefit more from a second year of coaching;
- teachers with higher initial skills might be better placed to take better advantage of coaching and thus widen the gap further with their less-skilled peers over 2 years i.e. the so-called Matthew effect;

- the individualised nature of coaching would allow mentors to start with the professional's specific knowledge and skill level. This might reduce initial individual differences (adapted 2012, p.134).

Although the study was conducted in the USA the workforce diversity and composition bear important similarities with that of the UK. We can see how targeting coaching resources on the least well qualified and skilled would be most beneficial since it could be tailored to meet individual levels of knowledge and skill, rather as in the apprentice model i.e. experts modelling and scaffolding learning. Other papers return similar findings in support of coaching models, which include EY practitioners with a range of qualifications. Future research might focus on the role played by duration, frequency and intensity in achieving impact from professional learning approaches, particularly in a climate of both financial austerity and an urgent need to find solutions to the skills gap in the EYE workforce.

What are the features of and the theory of action underpinning effective professional learning approaches in EYE?

From examining the above it seems clear that the most effective approaches to PDL are those that marry the introduction of new knowledge with opportunities reflection and interaction. Often such knowledge is research-based but in all cases must be accessible such that practitioners will be able to relate it to their current practice and context. Working with a coach to identify how to rectify shortcomings or to enhance how the approach may be further improved appears effective. But peer-to-peer support can act in similar ways to help practitioners understand how to refine and apply the approach in question. As such it would seem the most effective approaches reflect social constructivist models of effective learning.

What types of professional learning opportunities are available to EYE practitioners and who provides them?

We have been unable to find reliable information about the types of PDL currently on offer to the EYE in the UK, and whether or not it might benefit children's learning. We do know that PDL in the UK is delivered by a wide range of providers and facilitators including academics from higher education institutions, Local Authorities, private consultants who may have previously been teachers and head-teachers, private companies who have developed a particular product or approach, colleagues in settings and schools and increasingly via social media, comprising a mixed offer of one-off workshops, conference days, lectures, staff meetings or bespoke university-led programmes. Home-based child-minders are the least well served with PDL opportunities. Members of our advisory group reported that in a climate of limited resources, priority is increasingly given to operational and regulatory training

around first aid, health and safety and child protection procedures. It highlights for us a concern that we simply do not have reliable data on the types of PDL already on offer to the sector and the prevalent modes of delivery. This prompts some important questions:

- What impact if any is PDL having on improving outcomes for children?
- To what extent are current PDL opportunities in the EYE informed by the best available research evidence?
- Is PDL in the EYE of acceptable quality?

Establishing a reliable quality assurance mechanism is an area for future research and sector debate.

CONCLUSIONS AND IMPLICATIONS FOR RESEARCH

When we set out to undertake this review it was on the assumption that it would be a first step in understanding how PDL impacts on children in the EYE sector. Our aim is to build on the findings presented here in order to pursue further research and work with the sector to develop evidence-based guidelines for best practice in PDL for setting leaders and policy makers. Our review has brought together evidence on the impact of PDL interventions on children's outcomes. Following a rigorous and systematic screening of over 1,000 studies we found only 24 that met our criteria and the requirements of our quality assessment protocol. Of the 24 papers we considered in our final included set, we were surprised to find that none were conducted in the UK. There are a number of ways we can interpret this interesting finding. First, evidence-informed practice, although now firmly embedded in policy and practice in the 5-18 school sector, is relatively new in relation to EYE in the UK. Several influential reports of PDL have been undertaken but none considered interventions in EYE or the specific challenges facing the EYE sector. Secondly, EYE has only relatively recently come into the centre of policy and received the attention it now benefits from. The research effort in EYE provision in the UK is increasingly achieved through dedicated funding calls from organisations such as the Education Endowment Foundation and indeed, the Nuffield Foundation who funded the review reported here. All this is to the good and will enable the EYE sector in the UK to be informed by a stronger evidence base. Of the 24 interventions we considered, all but two were conducted in the USA. All included studies were funded by individual state or federal government funding calls, as part of a national strategy to address educational disadvantage. We are mindful about placing too much emphasis on findings gathered in a different national and/or cultural context. That said, although there is much variation in the ways in which early education is provided here in the four countries of the UK, we have much in common with the USA in regard to the current demand for expansion

of provision, a skills shortage in the early childhood sector and a policy drive for children to be ‘school ready’ and the nature and shape of the EYE curriculum (see also Chambers et al, 2010).

There are important links between the type of intervention programme on the one hand, and how the workforce is conceptualised by policy-makers, administrators/leaders and parents in terms of its standing, professional status and type of learner. The low status, pay and conditions of the EY workforce is noted in several reports (including Kalitowski, 2015) so it is important that work is undertaken to examine this, to challenge negative and misinformed perceptions about the nature of work with young children that supports the EYE workforce in its development as a profession. The professionalization of the early years/early childhood workforce internationally in recent decades, to some extent marks a ‘coming of age’ of the profession, and provides an important context for this review. The significant descriptive and qualitative literature on the concepts of professionalism, professional development/learning, leadership, qualifications and competency, relating to the early years field, testifies also to the widespread and enduring interest in the topic and related challenges, within the field. Noteworthy is that relative to this large body of (mainly) qualitative and conceptual studies in the field, the number of studies we have identified, which met our criteria and evaluated the impact of PDL on outcomes for children is strikingly low at 24. A further general observation commented on in the broad literature and in anecdotal accounts from our review advisory group is that professional learning experiences for EY educators are frequently short term, delivered in one-day workshops with little if any follow up and that this likely to increase as resources are further constrained. Delivery methods tend to be in the form of ‘expert’ lectures, conference presentations, possibly with some group work but with limited opportunities to share with colleagues and relate to practice. Research on adult learning (Dunst et al., 2010), and studies of professional development conducted in the 5-18 school sector (Cordingley et al., 2014), note that passive instruction and one off lectures/workshops may be a useful and an efficient, cost-effective way to impart factual information about regulatory requirements such as health and safety, but that genuine changes in professional practice are unlikely to come about through such methods of delivery and require a different approach (Tillery et al., 2010).

One outcome of this review is to argue strongly for a greater attention to be paid to the impact of PDL on children’s learning and developmental outcomes. This shift in focus need not exclude enhanced development of practitioner skills. Indeed, in all of our included studies, practitioners’ and children’s development were more or less linked. But a focus on children would encourage a greater focus on evidence on quality provision of PDL.

PDL as a means by which to achieve specific outcomes in teaching quality, particularly in relation to improving children's basic skills in literacy, language and mathematics may appear to be underpinned by accountability to school, district (in the USA) and national agendas for driving up educational standards following. However, we do not see these perspectives as mutually exclusive. Rather we have come to the view, based on the review evidence, that it is possible to achieve positive impact on children's outcomes and at the same time offer a rich and professionally rewarding experience for EYE workers.

The present review has identified intensive coaching models as a potentially important approach to improving children's outcomes as long as it is coupled with a clear content focus and linked to practitioners' setting contexts and experience. Coaching from more expert peers provides a responsive approach for a diverse workforce with wide variation in skills, knowledge and qualification. Further research, however, is needed on identifying the optimum duration, frequency and intensity to maximise limited resources available to support PDL. In the longer term, we recommend that the EYE sector (including schools), might work with Local Authorities, Teaching School Alliances, Multi Academy Trusts and/or government to develop a set of agreed guidelines or minimum standards for the quality assurance of PDL, its pedagogy and the mode of delivery appropriate to the type of learning and content delivery required.

Finally, we strongly recommend that investment in developing high quality PDL opportunities in EYE should be a priority, alongside the qualifications route. Although we recognise that further work is need to fully understand which types of PDL have the greatest impact and are most cost effective, the review provides useful evidence to show that certain types of PDL can help to improve the quality of pedagogical interactions between adults and young children and enhance subject knowledge, which in turn can significantly benefit, children's developmental and learning outcomes. The potential benefits of this to children's school readiness and social-emotional development seem clear. However, arguably the most important factor in ensuring that the positive benefits of PDL programmes have long lasting and sustainable impact is the full commitment and on-going support of school and setting leaders, and ultimately that of policy-makers and government.

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Study design	Topic of PD	Duration PDL	Content group	Composition Workforce
RCT	Early mathematics	6 months	24 teachers. 16T & 111C (intervention) 8T & 33C (control)	36% High-School 17% Associate 31% BA 14% master
RCT	Joint attention engagement (Language)		48 childcare providers	16 High-School, 28 College 3 Associate 1 BA
RCT	Quality ECE	3 months training	180 caregivers, 114 ECE rooms,	1% No High-School diploma 78% High-School 3% some

				college, 10% Associate 7% BA 1% Post-bachelors' work
Quasi experimental with intervention and control group	Early mathematics	2 years	No info	No Info
Intervention	Language, literacy	3 years	8 Head Start classrooms	8 BA 6 masters' degree. 4 assistants 60 hr college credit
Descriptive non experimental	Children's behaviour	14 weeks	10 teachers and 19 children	10 BA degree and current teacher certification.
RCT	Language, literacy	2 years	161 teachers, 1,338 children	62.1% BA 36% advanced degrees
RCT	Language	1 school year	16 mentors	62.5% college degrees.